REMARKS

In the January 9, 2009 Office Action, claims 28, 31, 33 and 37-38 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,027,911 (Gilmore) in view of A.H. Church, "ALTERING WOUND SPRINGS To Modify Their Deflection Rates" (Church). This rejection is respectfully traversed.

Claim 28 calls for a method of preparing and using a coil spring in a pressure relief valve and requires a) measuring the spring rate of the coil spring; b) modifying the spring after measuring its spring rate so as to modify its spring rate to be within ±2% of a target spring rate, and c) building a pressure relief valve having an inlet, a disk member closable on the inlet and a mechanism biasing the disk member on the inlet, a body, and an outlet, wherein the disk member and inlet are configured to provide a huddling chamber, with the modified coil spring being used in the biasing mechanism.

The Office Action takes the position that Gilmore discloses a relief valve device, and that it would be desirable to have a valve with a different spring rate for varying applications. The Office Action also takes the position that Church teaches a method of measuring a spring rate and then machining the outer diameter of the spring until the spring is within a specific tolerance. It is then asserted that it would have been obvious to have provided Gilmore with a spring having its spring rate modified by the teachings of Church to provide a spring which will operate to the designed pressure, within proper pressure tolerances and further to ensure reliability.

As explained earlier, the present invention came about during the development of a pressure relief valve that has a snap-type opening characteristic with a low blow-down value, and further where the blow-down value is not contingent on the downstream piping. The design of such a valve is outlined in the specification. During the development of the new valves, and a method of manufacturing such valves, it was discovered that the spring rate used in such valves had to be unusually consistent (±2%) from one spring to the next in order to be able to make a series of valves that could cover the expected operating ranges for the series, as explained on pages 4-7 and 21 of the specification. This is opposed to the situation in typical prior art safety relief valves, where the adjustment screw setting can simply be adjusted to deal with a

spring rate difference from one spring to the next of a typical range of ±7% when setting the set pressure for the valve.

Gilmore discloses a plastic seal ring pressure relief valve that includes a spring 48 that holds a valve 38 on seat 45 until sufficient pressure on the valve lifts valve 38 off the seat. At this point the valve has a high blow-down value, meaning that the valve stays open until the pressure in the inlet falls well below the set pressure that was sufficient to first dislodge the valve from the seat. Gilmore has a threaded sleeve 32 bearing on the upper portion of spring 48. Sleeve 32 can be screwed downwardly to increase the compression of spring 48, thus increasing the set pressure. Gilmore is thus like a typical pressure relief valve in the fact that the set pressure is adjustable by adjusting the preloaded force that is applied by a spring. To obtain greater force, the sleeve 32 is turned, compressing the spring, and thereby generating more force. There is nothing in Gilmore that suggests that it is desirable to have a valve with a different spring rate for different applications as alleged in the Office Action. Instead, Gilmore teaches, in col. 3, lines 57-62, how to adjust the spring force to achieve a desired spring force. There is no suggestion that the spring needs to have any specific spring rate, or that springs with different spring rates would be desirable for different applications.

There is no reason, absent hindsight of the present invention, to combine the teachings of Gilmore and Church. Church notes that wound coil springs have a usual tolerance of ±5%. Church then goes on to discuss ways of modifying the rate of such springs. However, the only uses for springs that need such modified rates discussed in Church are weighing devices and governors. There is no suggestion that springs used in pressure relief valves need to have a tight range of spring rates. And in fact, the vary nature of Gilmore in particular, and prior art pressure relief valves in general, dictates that the springs with a commercial tolerance in the spring rate are acceptable. When a device such as the pressure regulating valve of Gilmore is built, it is a simple matter to deal with a variation in the rate of the given spring used to build the specific device by simply turning sleeve 32 to obtain the desired compression and hence the desired spring force.

There is no teaching or suggestion in Gilmore to either measure the spring rate of any spring, or to modify the spring rate. The Examiner posited, during a prior

telephone interview discussing a comparable reference, that at the extreme ends of its set pressure range, there would be a need for a tighter spring rate in the spring, which would then be served by modifying spring rates as taught by Church. However, this suggestion is not born out by prior art practice. Prior to the present invention, manufacturers of pressure relief valves take into account the spring rate variation when engineering the valve and the range of set pressures it will be suitable for. As outlined on page 4 of the specification, valve manufactures typically specify a reduced operating range for their valves to account for the spring rate tolerance. Until the present invention, a person of ordinary skill in the art would not have thought of taking a given spring and modifying its spring rate and then using the modified spring to build a pressure relief valve.

Since it would not have been obvious absent hindsight of the present invention to combine the teachings of Gilmore and Church, claim 28 is patentable over Gilmore and Church. Claims 31, 33, 37 and 38 are dependent on claim 28 and are patentable over Gilmore and Church for at least the same reasons as claim 28. Thus, all the claims under consideration in the application are allowable over the cited prior art. Further, since claim 28 is a generic claim, the allowability of claim 28 requires the species restriction to be withdrawn. Claims 29, 30, 32 and 34, dependent on claim 28, should be brought back into consideration and allowed.

Claim 38 is further patentable over Gilmore. Claim 38 requires a secondary orifice between the valve seat inlet and the outlet, the secondary orifice being sized so that gas flows from the inlet in a sonic flow and so that gas flows through the secondary orifice in a sonic flow when the valve opens due to a pressure in the inlet exceeding a set pressure. The Office Action refers to "orifice" 48 in sleeve 56 as satisfying this requirement. However, Gilmore teaches that sleeve 56 include multiple "ports" 48. There is no suggestion that these ports create an orifice that is sized to create sonic flow when the valve opens. On the contrary, a person of ordinary skill in the art recognizes that the ports are provided to have as much open flow area as possible. The ports are needed because the sleeve 56 is used to guide the valve to reclose. Since the sleeve exists, multiple ports must be provided through it to allow for escaping fluid. There is no reason from Gilmore to size these ports to create the required orifice.

It is believed that the case is in condition for allowance. An early notice to that effect is respectfully requested.

Applicants respectfully request the Examiner to review the claims and the prosecution history, including Office Actions issued by the U.S. Patent and Trademark Office, for U.S. Patent No. 7,337,796 and pending U.S. Patent Application Serial No. 11/840,053, since the specifications include common subject matter. The '796 patent issued from a divisional application of the present application. The '053 application is a divisional of the present application.

Respectfully submitted,

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